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**Attorney Docket No: 0263421-0044  
IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

**Applicant:** Lombari **Examiner:** Grosso, Harry A.  
**Serial No.:** 10/828,980 **Art Unit:** 3781  
**Filing Date:** April 21, 2004  
**Title:** EXPANSION TANK WITH DOUBLE DIAPHRAGM

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

**DECLARATION UNDER 37 C.F.R. § 1.131**

Robert Lombari declares as follows:

1. I am the Director of Research and Development with Flexcon Industries, located in Randolph, Massachusetts.
2. I am the inventor of the invention disclosed and claimed in the above identified patent application. In particular, the invention relates to a double diaphragm expansion tank and exemplary flow-through connectors therefore.
3. All of the events set forth in this declaration occurred in the United States of America.
4. I am submitting this declaration to establish completion of the invention disclosed and claimed in the above identified patent application in this country prior to March 5, 2003, the earliest priority date of published United States Patent Application No. U.S. 2004/0173624 A1 to Carter.
5. Prior to March 5, 2003 I conceived of the invention disclosed and claimed in the above identified patent application. Thereafter, and also prior to March 5, 2003, I reduced the invention to practice.
6. I disclosed the invention described and claimed in the above identified patent application in a document entitled "Next Generation Water Chamber," dated before March 5, 2003.
7. Exhibit A is a copy of the Next Generation Water Chamber document, which includes a description of the concept for a double diaphragm expansion tank according to the present application. The document discloses the idea of replacing the lower and upper butyl diaphragm of earlier expansion tanks with a rigid polypropylene container mating to a polymer based upper diaphragm. Further, Exhibit A states that "[p]rototype molds for upper and lower diaphragm components have produced operational samples. Double diaphragm assemblies have been tested for joint integrity and assembled into complete

tanks." All of these dates are prior to March 5, 2003 and have been redacted in Exhibit A.

8. I further disclosed the invention described and claimed in the above identified patent application in a document entitled "Development of a plastisol water chamber/diaphragm for JR6 8 liter expansion tanks." This document is attached as Exhibit B, and is dated prior to March 5, 2003 (dates have been redacted).
9. Exhibits C and D are CAD file drawings of the invention described and claimed in the above identified patent. The dates have been redacted, however the originals of these documents are dated prior to March 5, 2003.
10. Exhibit E is a 2001 Capital Project Request Form for the funding to develop prototype samples for the testing and feasibility of a plastisol replacement for butyl double diaphragms for expansion tanks. The original of this document is dated prior to March 5, 2003.
11. Exhibits A-E provide evidence of conception and actual reduction to practice of the invention as claimed. Notably, Exhibit B describes the objectives to develop a flexible membrane of plastisol materials and a non-flexible liner to be combined with the flexible diaphragm material utilizing a clenched design.
12. Flexcon Industries engaged attorneys of the firm of Choate, Hall & Stewart LLP to prepare and file a utility patent application around early July, 2003.
13. Thereafter, I reviewed the patent application and was informed that the patent application was filed on July 22, 2003.
14. I further declare that all statements made of my own knowledge are true and that all statements made on information and belief are believed to be true. I also understand that willful false statements and the like are punishable by fine of imprisonment or both under 18 U.S.C. 1001 and may jeopardize the validity of the application or any patent issuing thereon.

Respectfully submitted,

  
Robert Lombardi

Date: February 2, 2007

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## EXHIBIT A

# Next Generation Water Chamber

## Concept

Cost reduction through product development maintaining the controlled action double diaphragm principle comprising independent air and water chambers and a controlled action rigid member. Existing Butyl material has proven reliable in extended service life and analysis of double diaphragm history indicates the lower double diaphragm half exhibits no indication of wear or degradation. Initial research began with elastomer suppliers in 1997.

Development of alternative diaphragm material of dissimilar characteristics, a rigid lower and flexible upper component, indicates cost reductions can be realized in the controlled action double diaphragm design.

Replacement of the lower and upper butyl diaphragm with a rigid polypropylene container mating to a polymer based upper diaphragm with comparable properties as the existing Butyl can be realized with available technologies.

Clench ring and water connection seal specifications require compatible materials for leak-free attachments leading research into the application of plastisol polymers.

Plastisol polymers introduced commercially over the past 5 years have improved in both seal development and polymer properties and are in wide use in the automotive industries for gasketing and diaphragm pump industries for flexible members.

Compression seals at the rigid clench ring member were developed using the side wall seal joint method as practiced in gasket design which use plastisol material.

Water connection seals are of a sandwich design using gaskets as sealing surfaces.

## Status

Target product for the next generation diaphragm was chosen as the 2.1-gallon (8 liter) thermal expansion tank. Product criteria will include domestic hot NSF and WRc certification for all water contact surfaces as well as for complete product listings. Structural requirements are to include APMO and European Community Pressure Equipment Directive.

Prototype molds for upper and lower diaphragm components have produced operational samples. Double diaphragm assemblies have been tested for joint integrity and assembled into complete tanks.

Laboratory cycling has indicated extended cycle life as compared to Butyl without the use of lubrication. Improved characteristics for abrasion and material fatigue are evident from extended cycle testing.

Service testing is being conducted with limited inventories introduced to the field.

Created *Date*  
*Redacted*

**EXHIBIT B****Development of a plastisol water chamber/diaphragm for JR6 8 liter expansion tanks.****Premise**

A water chamber of a plastic based material must satisfy the criteria of the existing material design and meet the criteria of NSF hot potable water contact as well as the structural requirements of IAPMO. The proposed design must be prototyped and verified for function prior to a design change. The proposed design is to encompass the double diaphragm principle in that it will comprise independent water and air chambers and connect at the water opening utilizing the existing press fit design.

**Objectives**

- 1) Develop a flexible membrane of preapproved NSF plastisol material in order to reduce process time and reduce production costs
- 2) Develop a non flexible liner to be combined with a flexible diaphragm material utilizing a clenched design and the existing water connection configuration in order to reduce cost and maintain the double diaphragm principle.

**Existing design costs**

Upper diaphragm	\$1.16
Lower diaphragm	\$1.16
Clench ring	\$0.85

**Proposed design quoted costs**

Upper diaphragm	\$0.85
Lower liner	\$0.40
Clench ring	\$0.85
sealing gasket	\$0.02

\$3.17\$2.22

Variance of existing design Vs proposed

\$0.96**Prototype costs**

Prototype mold upper diaphragm	\$10,000
Prototype mold lower liner	\$6,000
Clench ring	no change
Prototype samples	\$2,500
Material testing	\$3,500

\$21,000**Production molds**

Mold upper diaphragm	\$35,000
Mold lower liner	\$12,000

\$47,000**Estimated expenditure required to introduce proposed design**\$68,000**Units required to recover design expenditures**71204Date  
Redacted

Santo development cost 2

EXHIBIT B

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